

Spot Safety Project Evaluation

Project Log # 200703080

Spot Safety Project # 14-97-002

**Spot Safety Project Evaluation of the Actuated Flasher Installation at US 176 and SR 1807
(Oak Grove Rd/Roper Rd) in Henderson County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Samuel D. Coleman, EI

Traffic Safety Project Engineer

8/10/2007
Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 14-97-002 – Standard Flasher Installation at US 176 and SR 1807 (Oak Grove Rd/Roper Rd) in Henderson County.

Project Information and Background from the Project File Folder

US 176 forms a four leg intersection with SR 1807 (Oak Grove Rd/ Roper Rd). US 176 is a five lane roadway with a center turn lane and a speed limit of 45 mph. SR 1807 is a two lane roadway without turn lanes and a speed limit of 35 mph. The intersection is controlled by a stop condition on SR 1807. There are stop ahead signs at both approaches to the intersection along SR 1807. There are also flashers located atop the stop signs on SR 1807. There are “Vehicle Entering When Flashing” signs directed toward SR 1807 and activated by vehicles traveling along US 176.

The original problem statement was not included in the project background information file folder. The countermeasure chosen to alleviate any issues was an actuated flasher. The flasher installation was completed on 1/4/2002 at a cost of \$5,000

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes along the subject road, the crash data omitted from this analysis to consider for an adequate construction period was from December 2001 through February 2002. The before period consisted of reported crashes from February 1, 1997 through November 30, 2001 (4 years, 10 months) and the after period consisted of reported crashes from March 1, 2002 through December 31, 2006 (4 years, 10 months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The treatment data consisted of all crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the above information. Please note that Frontal Impact crash types influenced by the implemented countermeasure were the target crashes for the treatment location. These crash types considered are as follows: Left Turn, same roadway; Left Turn, different roadway; Right Turn, same roadway; Right Turn, different roadway; Head On, and Angle. The target crashes are clearly identified in the before and after period collision diagrams.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total Crashes	11	7	-36.4
Total Severity Index	5.0	16.1	218.8
Frontal Impact Crashes	7	7	0.0
Frontal Severity Index	4.2	16.1	284.9
Volume	7500	6500	-13.3
<u>Treatment Injury Crashes</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	N/A
Class A	0	1	N/A
Class B	4	1	-75.0
Class C	2	3	50.0
Property Damage Only	5	2	-60.0
<u>Frontal Injury Crashes</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Fatal	0	0	N/A
Class A	0	1	N/A
Class B	3	1	-66.7
Class C	0	3	N/A
Property Damage Only	4	2	-50.0

Table 1.

The naive before and after analysis at the treatment location resulted in a 36 percent decrease in Total Crashes, a zero percent change in Frontal Impact Crashes, and a 13 percent decrease in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2004.

Results and Discussion

The naïve before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 36 percent decrease in Total Crashes and a zero percent change in Frontal Impact Crashes. The summary results above demonstrate that the treatment location appears to have had a decrease in the number of Total Crashes and no change in the number of Frontal Impact Crashes from the before to the after period.

Referencing the before and after period collision diagrams, there is a change from random crash patterns to more discernable patterns. The patterns that exist are between southbound vs. eastbound vehicles and northbound vs. westbound vehicles. Recognizing the fact that crashes are occurring in the outside lanes on US 176, these crashes may be happening due to poor sight distance from the skew in the intersection. Driving east through the intersection there is a small tree (see circled tree in photo section) located on personal property, it may be possible to gain more sight distance if the owner were addressed and agreed to trimming it.

The calculated benefit to cost ratio for this project is -58.58 considering total crashes. The benefit to cost ratio considering only target crashes is -66.08 . The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of road.

TREATMENT BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 176 and SR 1807
COUNTY: Henderson
FILE NO.: SS 14-97-002

BY: SDC
DATE: 7/30/2007

DETAILED COST: TYPE IMPROVEMENT - Flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$5,000	10	0.149	\$745
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$5,000	10	0.149	\$745
--------	---------	----	-------	-------

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$500
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$350
TOTAL ANNUAL COST=	\$1,595
TOTAL COST OF PROJECT=	\$5,000

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES						ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	
BEFORE	4.84	0	0.00	6	1.24	5	1.03	\$26,343
AFTER	4.84	1	0.21	4	0.83	2	0.41	\$119,793

Annual Benefits from Crash Cost Savings (\$93,450)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$95,046)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -58.58

TOTAL COST OF PROJECT	-	\$5,000	COMPREHENSIVE B/C RATIO	-	-58.58
-----------------------	---	---------	-------------------------	---	--------

TARGET BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 176 and SR 1807
COUNTY: Henderson
FILE NO.: SS 14-97-002

BY: SDC
DATE: 7/30/2007

DETAILED COST: TYPE IMPROVEMENT - Flasher

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$5,000	10	0.149	\$745
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$5,000	10	0.149	\$745
--------	---------	----	-------	-------

ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$500
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$350
TOTAL ANNUAL COST=	\$1,595
TOTAL COST OF PROJECT=	\$5,000

COMPREHENSIVE COST REDUCTION:

TIME PERIOD	YEARS	ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES				PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
		K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR			
BEFORE	4.84	0	0.00	3	0.62	4	0.83	\$14,380
AFTER	4.84	1	0.21	4	0.83	2	0.41	\$119,793

Annual Benefits from Crash Cost Savings (\$105,413)

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = (\$107,008)

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = -66.08

TOTAL COST OF PROJECT	-	\$5,000	COMPREHENSIVE B/C RATIO	-	-66.08
-----------------------	---	---------	-------------------------	---	--------



Location Map: US 176 at SR 1807 (Oak Grove Rd / Roper Rd).

Treatment Site Photos taken July 18, 2007



Driving west on SR 1807



Driving west on SR 1807



Driving south on US 176



Driving south on US 176



Driving north on US 176



Driving north on US 176



Driving east on Roper Rd



Driving east on Roper Rd



Driving east on Roper Rd



On Roper Rd facing east looking north



On Roper Rd facing east looking south



On SR 1807 facing west looking south



On SR 1807 facing west looking north



